

A Portable Source of Lattice-Trapped and Ultracold Strontium (PLUS), Phase I

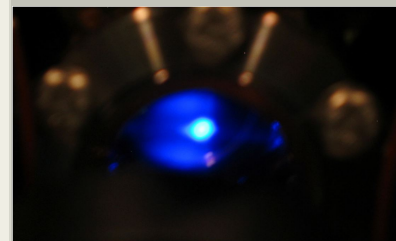
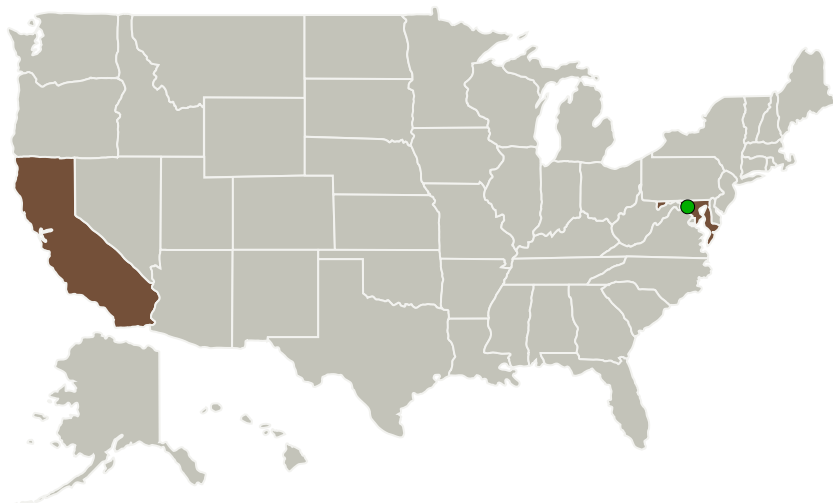
Completed Technology Project (2014 - 2014)



Project Introduction

We propose to design and demonstrate a portable source of lattice-trapped, ultracold strontium (PLUS). The device uses simplified and robust techniques for loading the traps, and directly leverages hardware already developed by AOSense. The simplified architecture for PLUS makes it amenable to future space qualification. When paired with a sufficiently stable local oscillator, PLUS can be operated as an optical lattice clock. Alternatively, the lattice-trapped atoms could serve as a starting point for producing quantum degenerate Sr gases for use in future sensor technologies or fundamental science studies. In the latter case, possibilities span explorations of artificial gauge fields to quantum information processing. In Phase I, AOSense will optimize the expected device performance through extensive modeling, trade-space analysis, and technology validation of the highest risk hardware. The design will cover the physics package and control system at the level of CAD models, ready for procurement that will begin during Phase II. We will also model device applications and generate a parts list and cost estimate for the construction of a prototype during Phase II.

Primary U.S. Work Locations and Key Partners



A portable source of lattice-trapped and ultracold strontium (PLUS) Project Image

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Organizations Performing Work	Role	Type	Location
AOSense, Inc.	Lead Organization	Industry	Sunnyvale, California
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

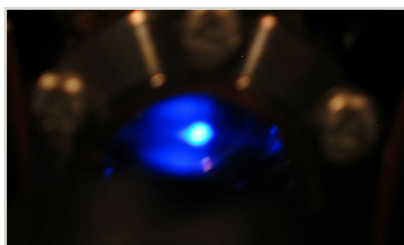
Primary U.S. Work Locations	
California	Maryland

Project Transitions

**June 2014:** Project Start**December 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140743>)

Images

**Project Image**

A portable source of lattice-trapped and ultracold strontium (PLUS)

Project Image

(<https://techport.nasa.gov/image/134342>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

AOSense, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

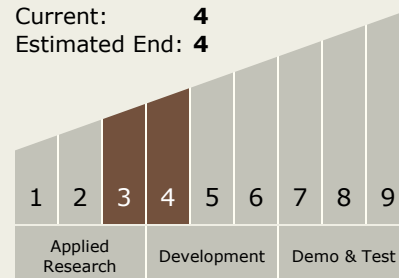
Tom Loftus

Technology Maturity (TRL)

Start: 3

Current: 4

Estimated End: 4



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.1 Field and Particle Detectors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System